CANDELED

www.candeled.com

-USB-DALI-PROTOCOL-

-CANDELED LDM-1		
Creation author **C. Schmitz**	Creation date **2013-10-01**	Document version **0.2**
Last Author **C. Schmitz**	Last Change **2013-10-02**	

Index

Changelog

AUTHORNAME	DATE OF CHANGE	CHANGES
C. Schmitz	2013-10-01	Initial release
C. Schmitz	2013-10-02	Added sequence diagrams

1 Scope of this document

This document describes the protocol format and the usage of the CANDELED USB-DALI device LDM-1. This device handles the connection between computers with USB interface and DALI luminaires or DALI ballasts.

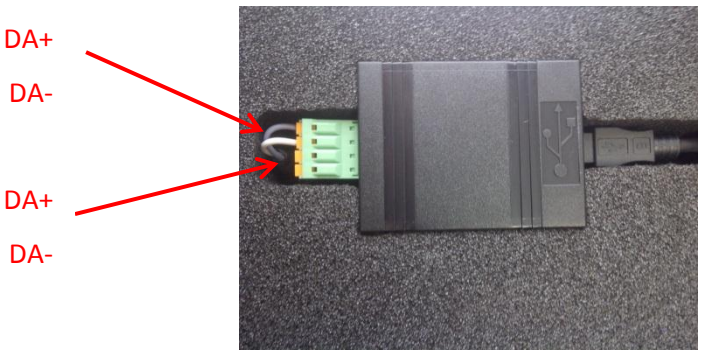
The audience of this document is programmers with a basic or detailed knowledge of the DALI protocol and specific DALI commands. The reader has read the DALI standards IEC 62386-101 and IEC 62386-102 at least once and has permanent access to these documents.

The programmer may use the device to write and test DALI master stacks or lighting management systems, test tools or production tools for DALI luminaires or DALI ballasts. The source code may be ported to embedded systems as needed. CANDELED does offer hardware and software design services under development contracts.

2 Introduction

The LDM-1 is a DALI Edition 1 master that can supply a small number of DALI ballasts (e.g. 20 devices consuming a maximum of 2mA on the DALI bus). The DALI bus power supply is designed to supply a maximum of 60mA. The device draws its supply current from the USB port of the PC. Therefore the USB driver has to be installed properly.

On the DALI side there are 4 connection pins to connect the device to the DALI bus. One pair each can be used. The other pair may be used to connect another group of lamps or to connect a DALI sniffer.



3 Protocol description

3.1 UART Settings

115200 Baud

8 Data-Bits

1 Stop-Bit

No Parity

3.2 Forward Frame

To send a forward frame open up a connection to your USB port and generate a frame of 3 bytes, consisting of a bit field in the first byte, followed by the DALI command you want to send.

The 2-byte DALI frame is extended by a third byte in form of a bit-field to circumvent to timing issues with DALI configuration commands that would otherwise come up. Therefore every single forward frame that is sent to the USB port will be followed at least by the answer “NAE”. This is necessary to establish a stable link between the application software and the timing sensitive DALI bus.

The DALI commands can be found in the public standards IEC 62386-1xx and IEC 62386-2xx.

Bit Field	Address Byte	Data Byte
0000.00CA C = Config A = Answer Expected C = 1: send twice C = 0: send once A = 1: wait for DALI answer (0x01 0x00 on timeout) A = 0: no answer wanted: answer directly with ‘NAE’	DALI address	DALI data

3.3 Backward Frame

To receive a backward frame, open up a connection to your USB port. The backward frames will only be forwarded if prior to receiving a backward frame a valid forward frame has been sent and if at the same time the “answer expected” bit has been set to ‘1’ in that specific forward frame.

The frame then will consist of two bytes:

Status Byte	**Data Byte**	***Description***
0x00 = Answer	Queried Value or „YES“ (0xFF)	-
0x01 = Timeout	0x00	*No device or “NO”*
0x02 = Framing Error	0x00	*A framing error has occurred*
0x03 = NAE	0x00	*No answer expected*

3.4 Examples

3.4.1 Broadcast DAPC(254)

- Send the forward frame: 0x00 0xFE 0xFE
- You will receive the backward frame: 0x03 0x00

3.4.2 Broadcast DAPC(0)

- Forward frame: 0x00 0xFE 0x00
- Backward frame: 0x03 0x00

3.4.3 Query control gear on address 0

- Assuming the control gear was set to address 0
- Forward frame: 0x01 0x01 0x91
- Backward frame: 0x00 0xFF

3.4.4 Store the DTR as fade time on address 0 with fade time 0

3.4.4.1 Set DTR to 0

- Forward frame: 0x00 0xA3 0x00
- Backward frame: 0x03 0x00

3.4.4.2 Check DTR content on device with address 0

- Forward frame: 0x01 0x01 0x98
- Backward frame: 0x00 0x00

3.4.4.3 Store DTR as fade time on device with address 0

- Forward frame: 0x02 0x01 0x2E
- Backward frame: 0x03 0x00

3.4.4.4 Check fade time on device with address 0

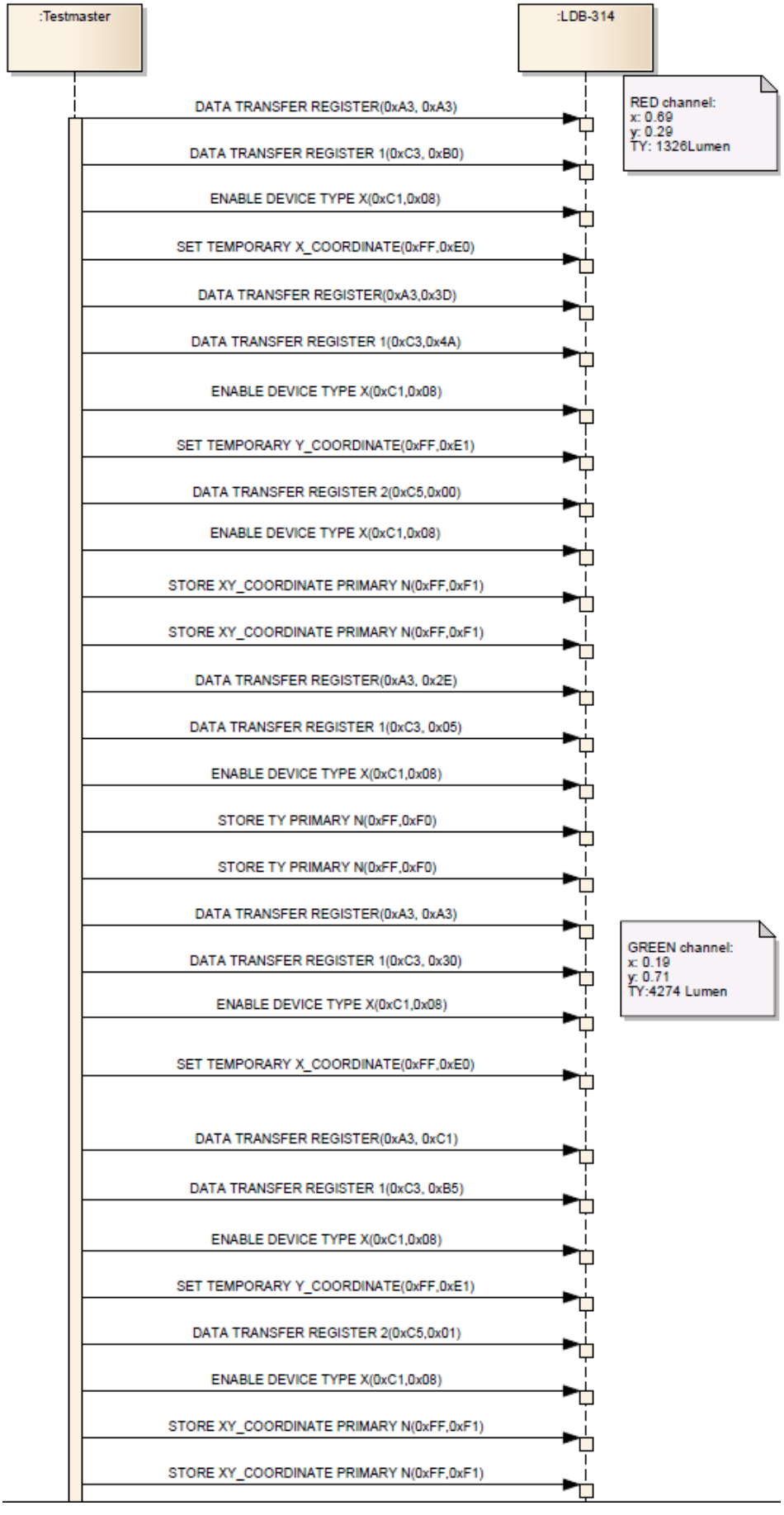
- Fade rate is assumed to be default = 7
- Forward frame: 0x01 0x01 0xA5
- Backward frame: 0x00 0x07

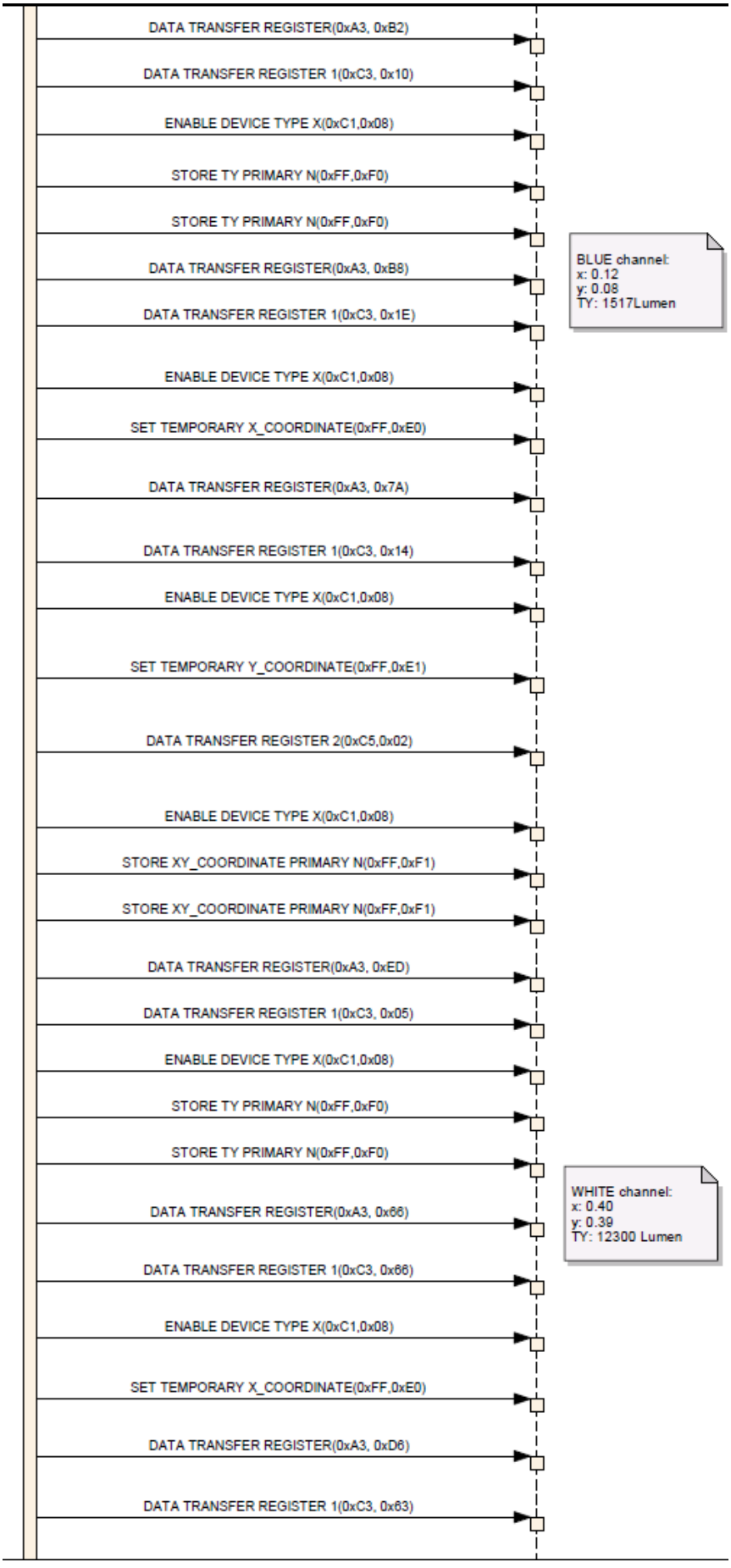
4 Colour control sequence diagrams

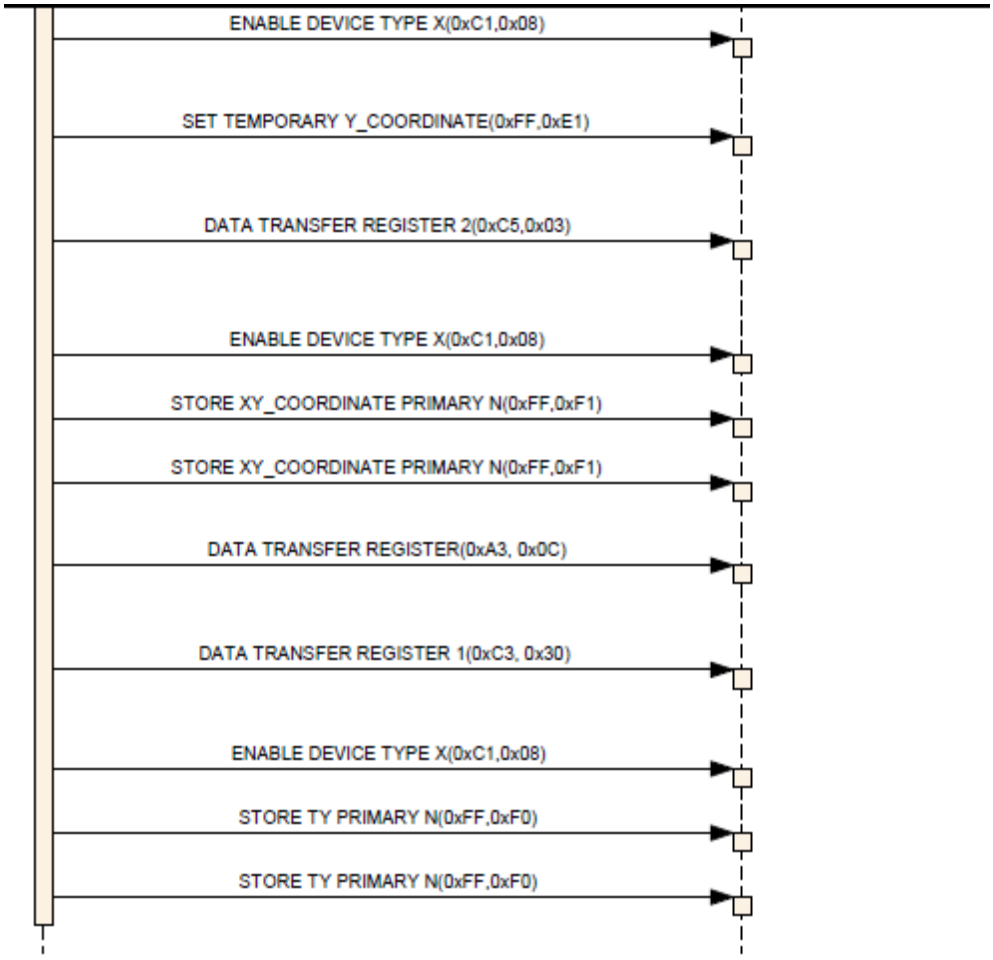
4.1 Calibration

WARNING: *Changing the calibration of your DALI Colour Control device without having the appropriate measurement equipment could irretrievably destroy your existing calibration.*

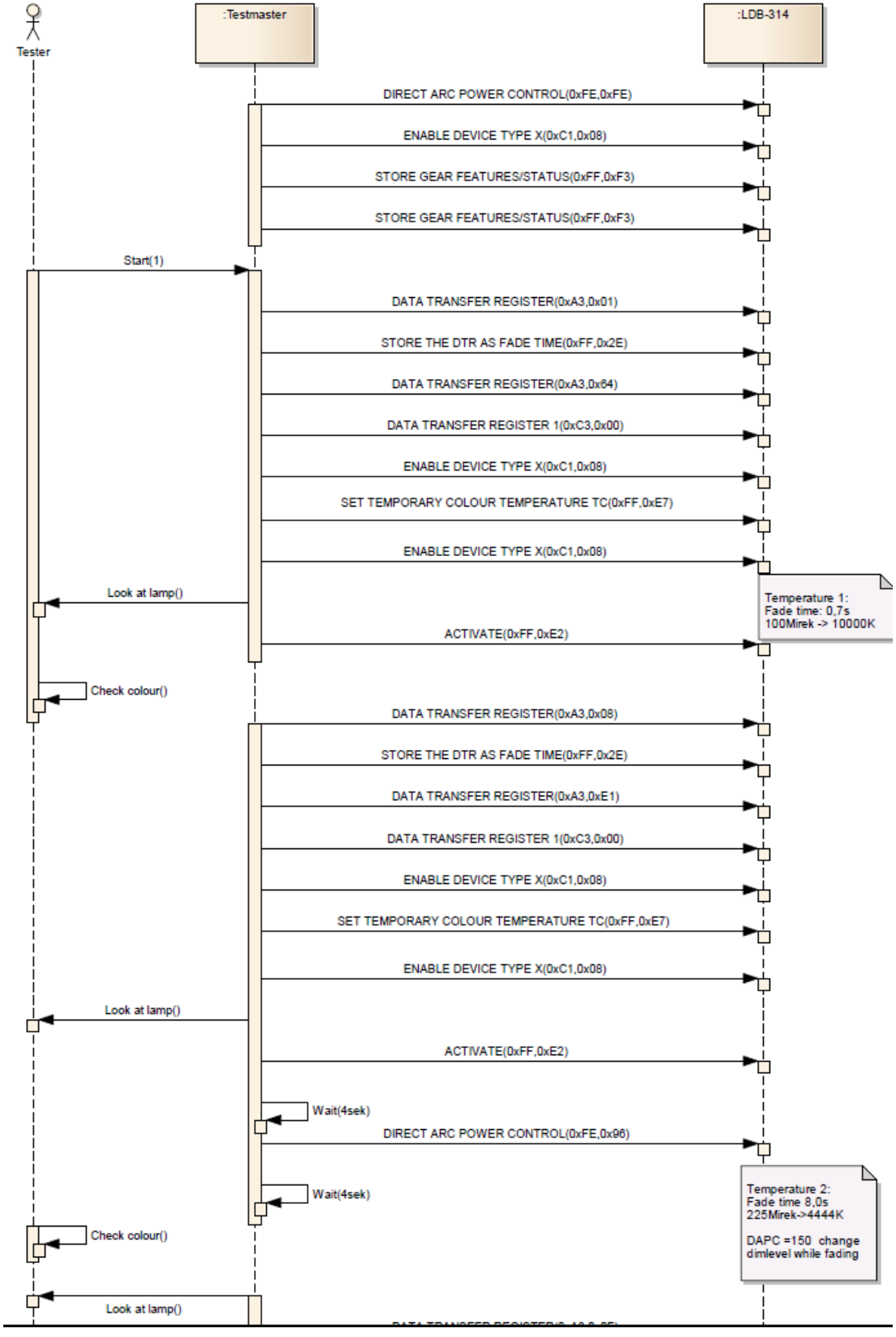
It is assumed that a CANDELED LDB-314 with Channel 0 = RED, Channel 1 = GREEN, Channel 2 = BLUE, Channel 3 = WHITE is being used. Other manufacturers may use other configurations.

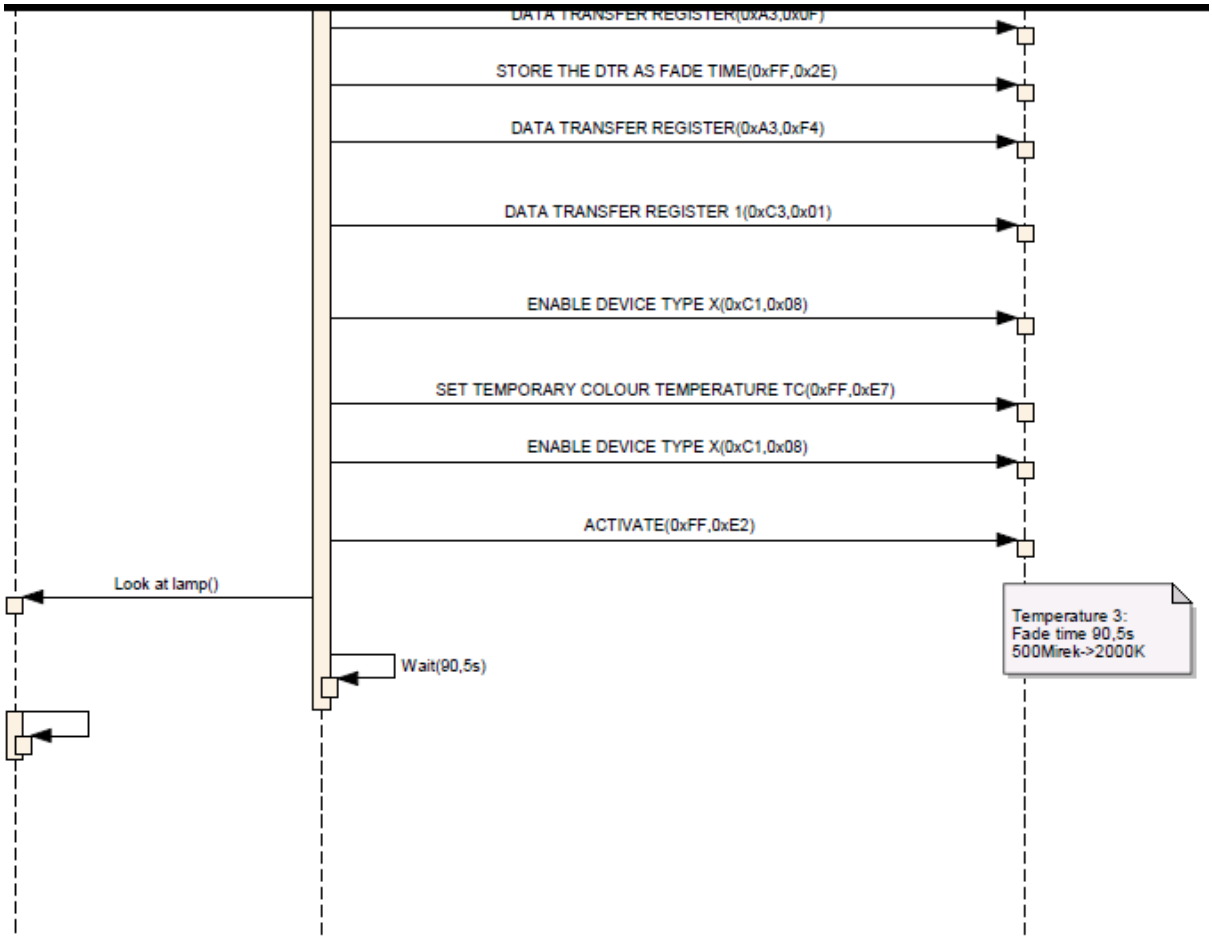

:Testmaster
:LDB-314
RED channel:
x: 0.69
y: 0.29
TY: 1326Lumen
DATA TRANSFER REGISTER(0xA3, 0xA3)
DATA TRANSFER REGISTER 1(0xC3, 0xB0)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY X_COORDINATE(0xFF,0xE0)
DATA TRANSFER REGISTER(0xA3,0x3D)
DATA TRANSFER REGISTER 1(0xC3,0x4A)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY Y_COORDINATE(0xFF,0xE1)
DATA TRANSFER REGISTER 2(0xC5,0x00)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
DATA TRANSFER REGISTER(0xA3, 0x2E)
DATA TRANSFER REGISTER 1(0xC3, 0x05)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE TY PRIMARY N(0xFF,0xF0)
STORE TY PRIMARY N(0xFF,0xF0)
DATA TRANSFER REGISTER(0xA3, 0xA3)
DATA TRANSFER REGISTER 1(0xC3, 0x30)
ENABLE DEVICE TYPE X(0xC1,0x08)
GREEN channel:
x: 0.19
y: 0.71
TY:4274 Lumen
SET TEMPORARY X_COORDINATE(0xFF,0xE0)
DATA TRANSFER REGISTER(0xA3, 0xC1)
DATA TRANSFER REGISTER 1(0xC3, 0xB5)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY Y_COORDINATE(0xFF,0xE1)
DATA TRANSFER REGISTER 2(0xC5,0x01)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)


DATA TRANSFER REGISTER(0xA3, 0xB2)
DATA TRANSFER REGISTER 1(0xC3, 0x10)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE TY PRIMARY N(0xFF,0xF0)
STORE TY PRIMARY N(0xFF,0xF0)
DATA TRANSFER REGISTER(0xA3, 0xB8)
DATA TRANSFER REGISTER 1(0xC3, 0x1E)
BLUE channel:
x: 0.12
y: 0.08
TY: 1517Lumen
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY X_COORDINATE(0xFF,0xE0)
DATA TRANSFER REGISTER(0xA3, 0x7A)
DATA TRANSFER REGISTER 1(0xC3, 0x14)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY Y_COORDINATE(0xFF,0xE1)
DATA TRANSFER REGISTER 2(0xC5,0x02)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
DATA TRANSFER REGISTER(0xA3, 0xED)
DATA TRANSFER REGISTER 1(0xC3, 0x05)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE TY PRIMARY N(0xFF,0xF0)
STORE TY PRIMARY N(0xFF,0xF0)
WHITE channel:
x: 0.40
y: 0.39
TY: 12300 Lumen
DATA TRANSFER REGISTER(0xA3, 0x66)
DATA TRANSFER REGISTER 1(0xC3, 0x66)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY X_COORDINATE(0xFF,0xE0)
DATA TRANSFER REGISTER(0xA3, 0xD6)
DATA TRANSFER REGISTER 1(0xC3, 0x63)

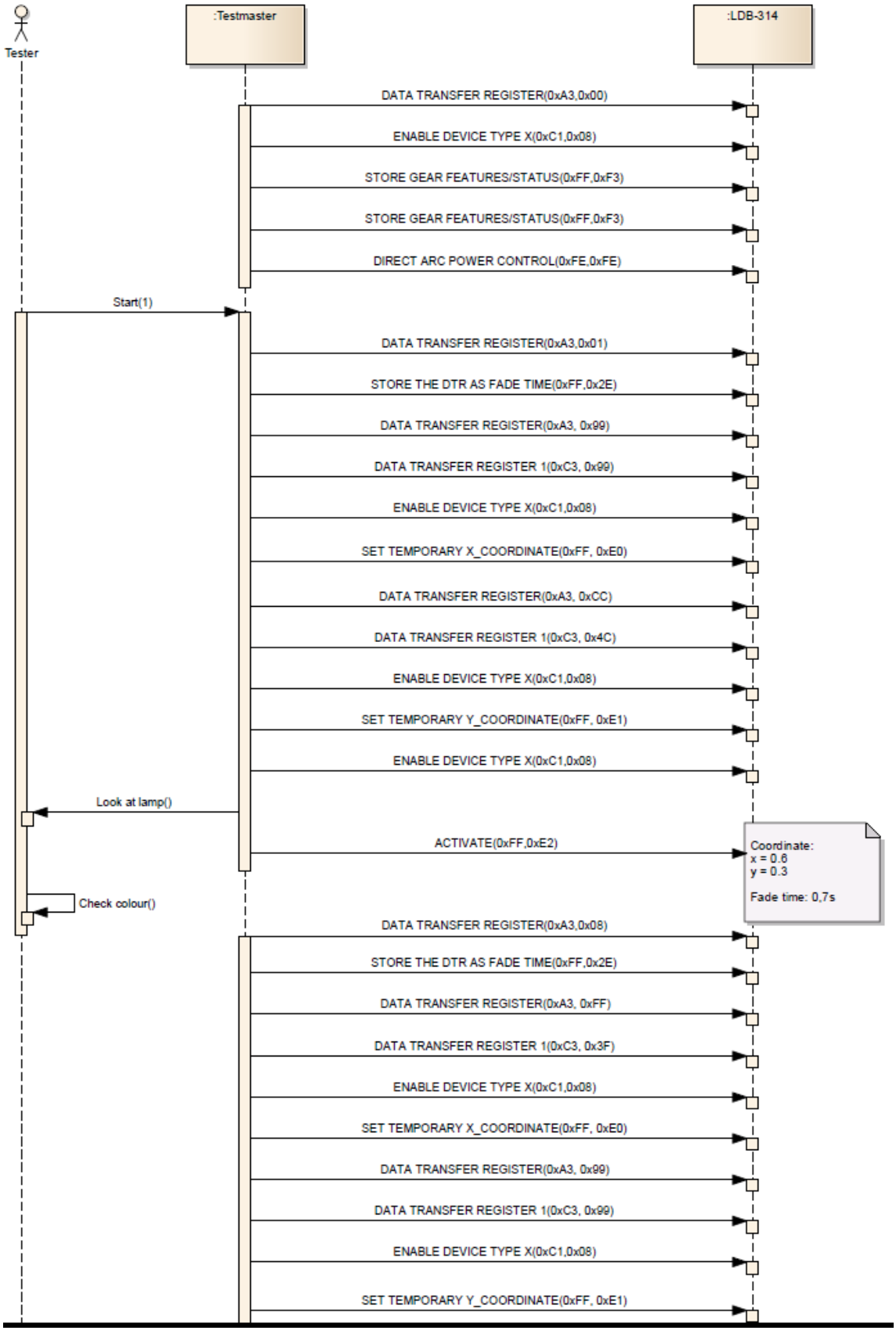

ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY Y_COORDINATE(0xFF,0xE1)
DATA TRANSFER REGISTER 2(0xC5,0x03)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
STORE XY_COORDINATE PRIMARY N(0xFF,0xF1)
DATA TRANSFER REGISTER(0xA3, 0x0C)
DATA TRANSFER REGISTER 1(0xC3, 0x30)
ENABLE DEVICE TYPE X(0xC1,0x08)
STORE TY PRIMARY N(0xFF,0xF0)
STORE TY PRIMARY N(0xFF,0xF0)

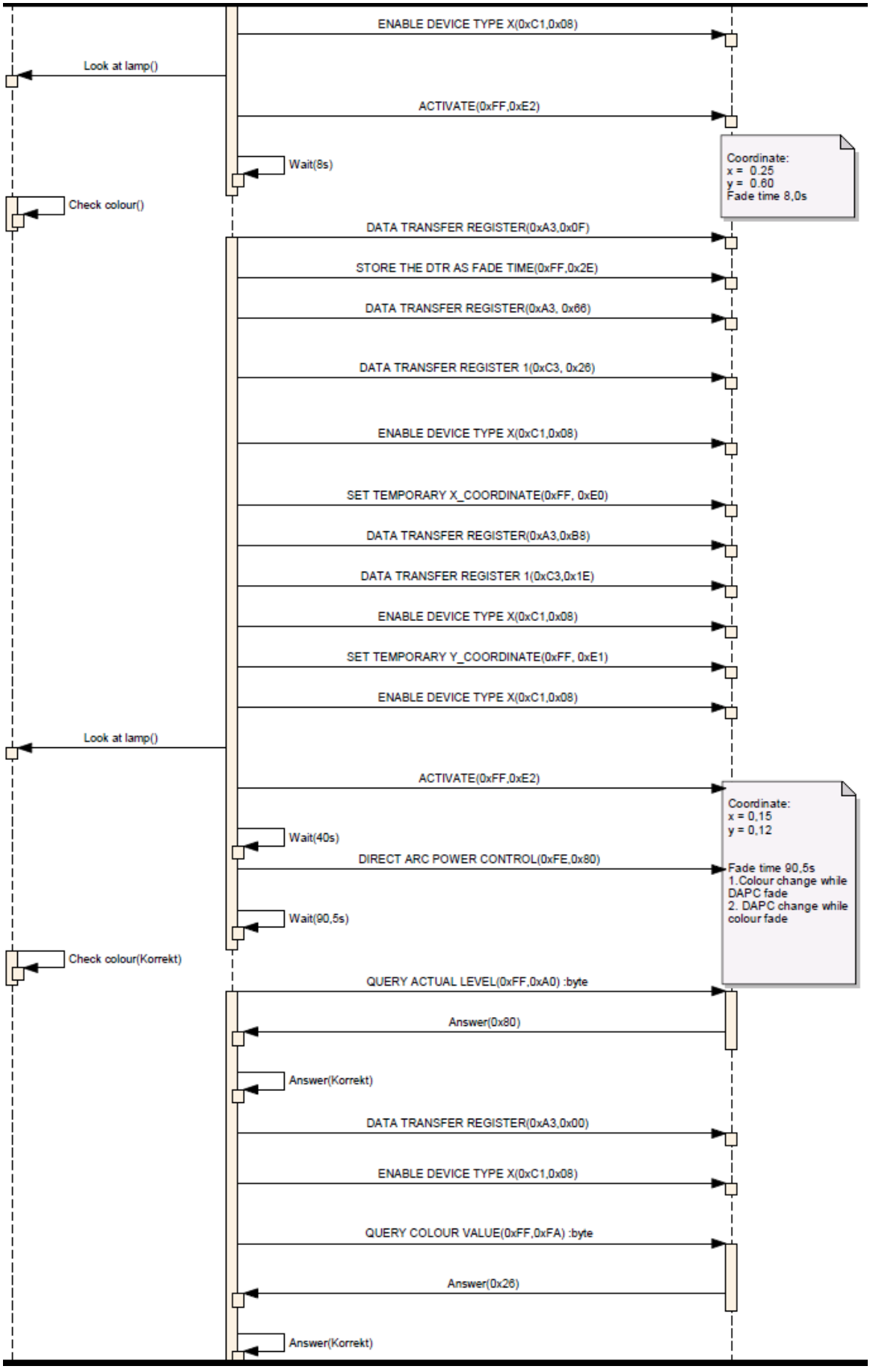
4.2 Tc temperature with fading

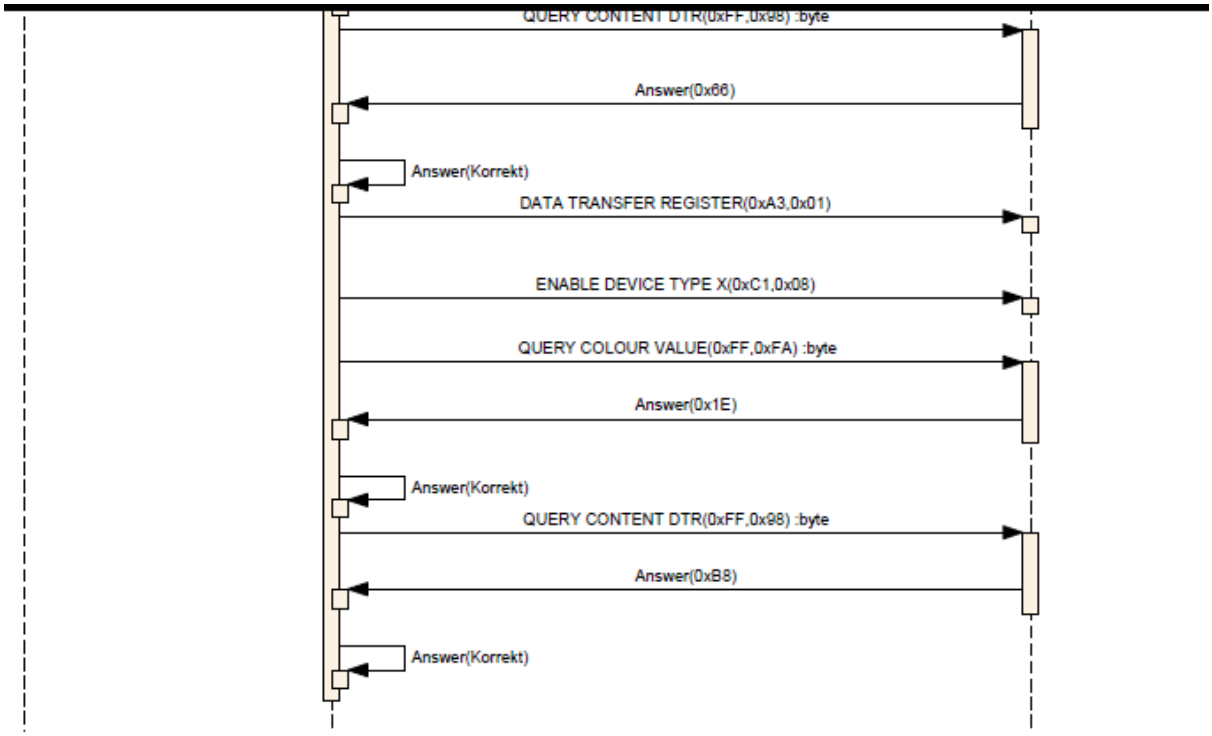



DATA TRANSFER REGISTER(0xA3,0x0F)
STORE THE DTR AS FADE TIME(0xFF,0x2E)
DATA TRANSFER REGISTER(0xA3,0xF4)
DATA TRANSFER REGISTER 1(0xC3,0x01)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY COLOUR TEMPERATURE TC(0xFF,0xE7)
ENABLE DEVICE TYPE X(0xC1,0x08)
ACTIVATE(0xFF,0xE2)
Look at lamp()
Temperature 3:
Fade time 90,5s
500Mirek->2000K
Wait(90,5s)

4.3 xy coordinate with fading




ENABLE DEVICE TYPE X(0xC1,0x08)
Look at lamp()
ACTIVATE(0xFF,0xE2)
Wait(8s)
Coordinate:
x = 0.25
y = 0.60
Fade time 8,0s
Check colour()
DATA TRANSFER REGISTER(0xA3,0x0F)
STORE THE DTR AS FADE TIME(0xFF,0x2E)
DATA TRANSFER REGISTER(0xA3, 0x66)
DATA TRANSFER REGISTER 1(0xC3, 0x26)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY X_COORDINATE(0xFF, 0xE0)
DATA TRANSFER REGISTER(0xA3,0xB8)
DATA TRANSFER REGISTER 1(0xC3,0x1E)
ENABLE DEVICE TYPE X(0xC1,0x08)
SET TEMPORARY Y_COORDINATE(0xFF, 0xE1)
ENABLE DEVICE TYPE X(0xC1,0x08)
Look at lamp()
ACTIVATE(0xFF,0xE2)
Coordinate:
x = 0,15
y = 0,12
Fade time 90,5s
1.Colour change while DAPC fade
2. DAPC change while colour fade
Wait(40s)
DIRECT ARC POWER CONTROL(0xFE,0x80)
Wait(90,5s)
Check colour(Korrekt)
QUERY ACTUAL LEVEL(0xFF,0xA0) :byte
Answer(0x80)
Answer(Korrekt)
DATA TRANSFER REGISTER(0xA3,0x00)
ENABLE DEVICE TYPE X(0xC1,0x08)
QUERY COLOUR VALUE(0xFF,0xFA) :byte
Answer(0x26)
Answer(Korrekt)


QUERY CONTENT DTR(0xFF,0x98) :byte
Answer(0x66)
Answer(Korrekt)
DATA TRANSFER REGISTER(0xA3,0x01)
ENABLE DEVICE TYPE X(0xC1,0x08)
QUERY COLOUR VALUE(0xFF,0xFA) :byte
Answer(0x1E)
Answer(Korrekt)
QUERY CONTENT DTR(0xFF,0x98) :byte
Answer(0xB8)
Answer(Korrekt)